Patented Dec. 12, 1939 2,183,224

UNITED STATES PATENT OFFICE

2,183,224

SHREDDING DEVICE

Sigurd Norman, Portland, Oreg., assignor to Pulp-Paper Machines, Ltd., Portland, Oreg., a joint tenancy composed of said S. Norman, A. C. Littig, and R. L. Hanson

Application December 14, 1937, Serial No. 179,683

9 Claims. (Cl. 144—176)

This invention relates to shredding devices for cutting successive slices from a piece of stock, as a step in processing.

It is peculiarly suited to severing wood chips from pulpwood stock, preparatory to making acid pulp paper stock and will be illustrated and described as used for that purpose, though not as a limitation.

Machines for the purpose indicated in the preceding paragraph are widely known as chippers and consist of a heavy disc-like revoluble cylinder provided with through slots and radial knives angularly set, to revolve their cutting edges in a plane in front of the disc, so that chips from stock fed to the knives will be discharged through the slots, only a circular zone of revolution of the disc being provided with the knives whose edges are radial to the axis of rotation of the disc. Such a knife setting gives a result similar to a fan with planar blades at an angle instead of curved ones, or a propeller with flat blades set angularly to the plane of rotation; each part of such a blade fights every other part. With a chipper, the result is seen in the product, which instead of being uniform as to fiber length as is desirable, runs all the way from granulation to slivers, with resultant heavy waste of power, nearly 50% waste of stock in some cases and a much poorer grade of pulp product.

An object of the present invention is a modification of the chipper that bores the slices from the end of a piece of stock, in much the same way that a "barefoot" or ship auger (without a center screw) cuts borings from the bottom of a hole, of uniform thickness and fiber length, which will answer all three problems stated in the foregoing paragraph, less power, very much less waste of stock and very much better uniformity of fiber length of resultant cuttings.

These and other beneficial results that will be at once apparent to those skilled in the art, constitute the objects of the present invention.

The invention herein consists in substitution of a shredding knife or bit with a curved external surface back of the bit edge so that it leads into the material to be shredded with equal lead at all points on its length, so that its "bite" into the material is uniform, the same as the bite of an air screw into the air.

The edges of the bits will preferably be radial to an axis of rotation, the center of which will be the intersection of all the edges projected to a common point, though the requirement is not rigid. The front of the bits, rearward of the edges, will be curved away, at uniform pitch, so that the lead angle of any edge is the same at all points and so that the heel of the cut stock will ride the curved surface, ready to be engaged by a succeeding bit, at a uniform chip thickness, as closely as may be attained by uniform bit setting. Though the curve changes as the diameter, or distance from the projected center, the pitch will be the same at all points. This curve of the bits is hereinafter referred to as "helicoidal".

I accomplish the stated objects and others referred to, by the structure illustrated and described in the drawings and the descriptive part of the specification hereinafter, in which—

Fig. I is a view of the working face of my new shredder, broken away in part to accommodate the view to the sheet;

Fig. II is a projection of Fig. I;

Fig. III is an enlarged view of one of the shredder bits and a part of another to be hereinafter explained;

Fig. IV is a section on the line IV—IV of Fig. III; and

Fig. V is an enlarged section on the line V—V of Fig. I diagrammatically delineating the mode of operation.

Fig. VI is a perspective view of the blade 6, showing the helicoidal surface somewhat exaggerated.

In the drawings, 1 is a cylindrical disc member that is mounted for revolution and revolved in any preferred manner, as diagrammatically indicated by the shaft 2. The outer or working face of the disc 1 is divided into three zones of revolution, an outer or shroud ring zone indicated by the numeral 3, an inner or neutral zone indicated by the numeral 4, and an intermediate working zone of revolution that is provided with a plurality of bits such as 6 and identical others shown in Fig. I spaced around the zone.

Slots 9 are formed in the cylindrical disc member 1 and so positioned that shreds removed by the bits 6 pass to a point of disposal, through the disc 1, as shown in Fig. V. The shroud ring 3 is for strength and may be omitted if sufficient material of requisite quality is otherwise distributed in the carrier disc. A rigid requirement of the bits, such as 6, is that their front surface back of the edge is curved backwards to provide a feed angle for the edge of the bit.

Since the bits are intended to be alike, the numeral 6 has been used to identify all of them that are referred to. The numeral 9 has also been used to identify the slots, for the same reason.

A chute such as 10, Fig. V, will be provided,

usually at an angle to the axis of rotation of the disc as is known, through which stock to be chipped will be fed endwise, as shown in this figure, the stock being so marked on the drawing.

Rough cut ends will first be bored off by the bits, which, when a full bite is obtained, will appear as shown in Fig. V. The lowermost bit 6 has finished its cut, but the stock still bears on its heel or curved portion indicated by H. This curved portion is what I have called a helicoidal curve, that is it falls away from the edge of the knife, equally, so that the feed of the stock into the bits is the same as the feed of a properly proportioned spiral auger into a piece of wood being bored. My new shredder bores borings from the end of the stock, as shown in Fig. V, the borings being of equal fiber length, which with collateral virtues such as less power and minimum waste of stock, satisfies what I set out to accomplish.

In Fig. III the letters *a*—*c* represent the outside and inside cutting edges of the bit 6, and *b* and *d* represent its trailing edge or back, where it ends in the slot placed under a succeeding bit. The rate of feed of the stock is determined by this curved surface as is clearly shown in Fig. V wherein the bit 6 is leading into the stock, by virtue of the pull of the beveled edge 6*a*. The stock is strongly drawn toward the bits and rides with the heel of the stock H2 on the heel of the bit H in firm contact. The stock also rides the helicoidal surface ahead of the knife edge until the cut is nearly finished.

It is important to note that the forward feed of the stock is continuous so long as the shredder is in operation and any stock is left, which continuity is enhanced if the bits are so placed that there is always at least one in working position beneath the chute 10 as shown. This completely cures the reactionary jump backwards of the stock that is a marked infirmity of the old type chipper disc with projecting edges in front of a straight face.

The bite of the bit will be the same in all cases and is fixed by the dimension "*e*", Fig. IV, which must be the same from end to end of any given bit else the cut will not be clean and the full virtue of the shredder will not be realized, which can only be accomplished by my new helicoidally curved boring bit as shown and described. The better it is made the better it will work and the better will be its product.

It will thus be seen that my shredder is a boring tool in the form of a spiral auger having as many spirals as cutting edges, the spirals or helicoidal surfaces on the leading side of the bits regulating the penetration into stock, hence the length of the chip, along the grain of the wood (in this case). It will also be seen at once that a tool made with a different pitch of the helicoidal surface is required for each chip length that may be indicated for different woods and that there is no adjustment, as in the old chipper discs; only a tool properly designed for a given chip length is capable of producing it.

The drawings show the bits as inserted, which may be accomplished in any preferred manner and the heel of the bit and its abutting portion of the mounting has been regarded as unitary in the description, which is functionally true.

Having disclosed my invention so that its use for an important industry may be practiced by following the instructions, but not intending that detailed description as limiting the scope of my invention, what I claim as new and desire to secure by Letters Patent, is—

1. A shredding device comprising a disc-like member that is mounted for rotation, shredding bits radially mounted on the disc with their cutting edges in spaced position in advance of the face of the disc, means for feeding material to the bits and means for passing shredded material to a point of disposal, the said bits being characterized by being provided with helicoidally receding external surfaces of uniform pitch back of their edges, whereby the feed advance of material to be shredded is uniform from end to end of the bits.

2. A shredder mechanism including a cylindrical disc member that is mounted for revolution, radial boring bits made rigid with the working face of said cylindrical disc member, the cutting edges of which project beyond the same zonal surface of revolution of the cylindrical disc member, a clearance through said cylindrical disc member for borings removed by the said bits and a receding spiral heel for the said bits that has the same pitch from end to end of the bits, whereby the bite of a bit into material presented is the same at all points along the edge of the bit.

3. In a shredding device, a rotary disc type carrier member, a plurality of boring bit members radially mounted on the face of the disc, means for feeding stock to the bits and clearance apertures through the carrier member for shredded material, the said bits being characterized by placement of their cutting edges in a plane normal to the axis of rotation of the disc mounting with their outer surfaces helicoidally curved away from the plane of rotation of the edges to limit the lead of the edges into the stock.

4. In a shredding disc of the character described, a disc member, clearance openings formed through the disc, a zonal series of shredding bits arranged to deliver shreds through said openings, means for presenting stock against the shredding bits and a feeding means for the stock that includes a helicoidally curved heel surface of the bit beginning at the edge thereof and ending at a point that will give the following bit a predetermined uniform bite into fed stock.

5. In a shredding device, a rotative disc member, a plurality of radial shredding bits of the character described that are spaced around a zone of revolution on the face of the disc, self feeding mechanism for the bits that includes a leading edge with a helicoidally curved heel for each bit and means for maintaining continuity of the feed which includes a feed chute and a bit spacing that provides for at least one bit in operative position under the chute at all times.

6. In a shredding disc of the character described, bits on the face of the disc that are arranged to bore successive shreds from the end of a piece of stock to be shredded, helicoidal heel surfaces of the bits to limit the rate of feed of the material to be shredded to the bits and a spacing for the bits in such manner that engagement of bits with the stock shall be without interruption.

7. A shredding disc, comprising a disc member that is mounted for revolution, the face of the disc being divided into three zones, an outer or shroud ring zone, a center neutral zone and a working zone that is an assembly of cutter bit members provided with edges adapted to engage stock fed thereto, said bits having helicoidally curved back surfaces to fix the lead of the edges

into stock and means to dispose of the chips through the said disc member.

8. A shredding disc apparatus, comprising a disc-like member that is mounted for revolution, a working zone of revolution on one face of the disc, spaced cutter bits distributed around said zone that are adapted to attack stock fed thereto, means for feeding stock to the bits and means for disposal of the cut stock, the said bits being characterized by being provided with helicoidally shaped surfaces following the edges thereof that are adapted to fix the lead of the edges into stock.

9. A device for reducing pieces of material to chips, comprising a disc member that is mounted for revolution to present a zone on one side thereof as a working face, knives mounted on the working face in generally radial relationship with their edges in advance of the outline of the said working face that are formed to positively engage material fed thereagainst, a material feeding means cooperative with the working face and through slots for disposal of chips cut by said knives when material is fed thereagainst, the said knives being characterized by being provided with helicoidally receding surfaces rearwardly of their edges that are coextensive with that part of the working face zone between the knives.

SIGURD NORMAN.

Dec. 12, 1939. S. NORMAN 2,183,224

SHREDDING DEVICE

Filed Dec. 14, 1937 3 Sheets-Sheet 1

Fig. I

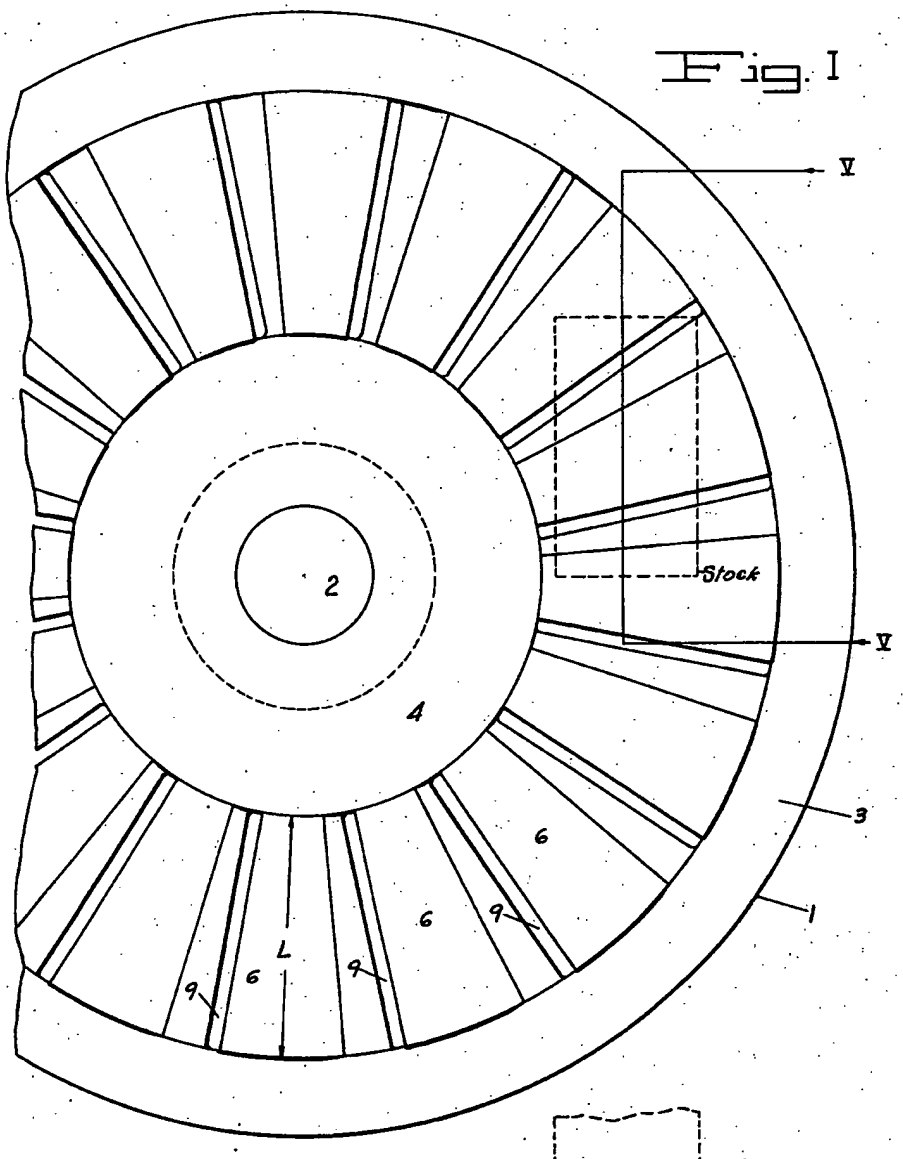
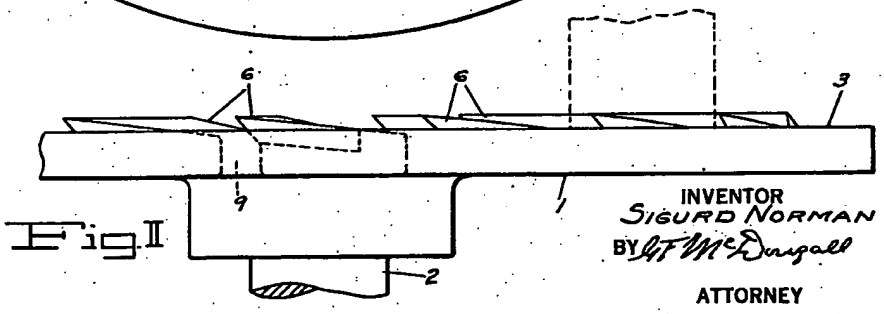


Fig. II



INVENTOR
SIGURD NORMAN
BY G. F. McDougall
ATTORNEY

Dec. 12, 1939. S. NORMAN 2,183,224

SHREDDING DEVICE

Filed Dec. 14, 1937 3 Sheets-Sheet 2

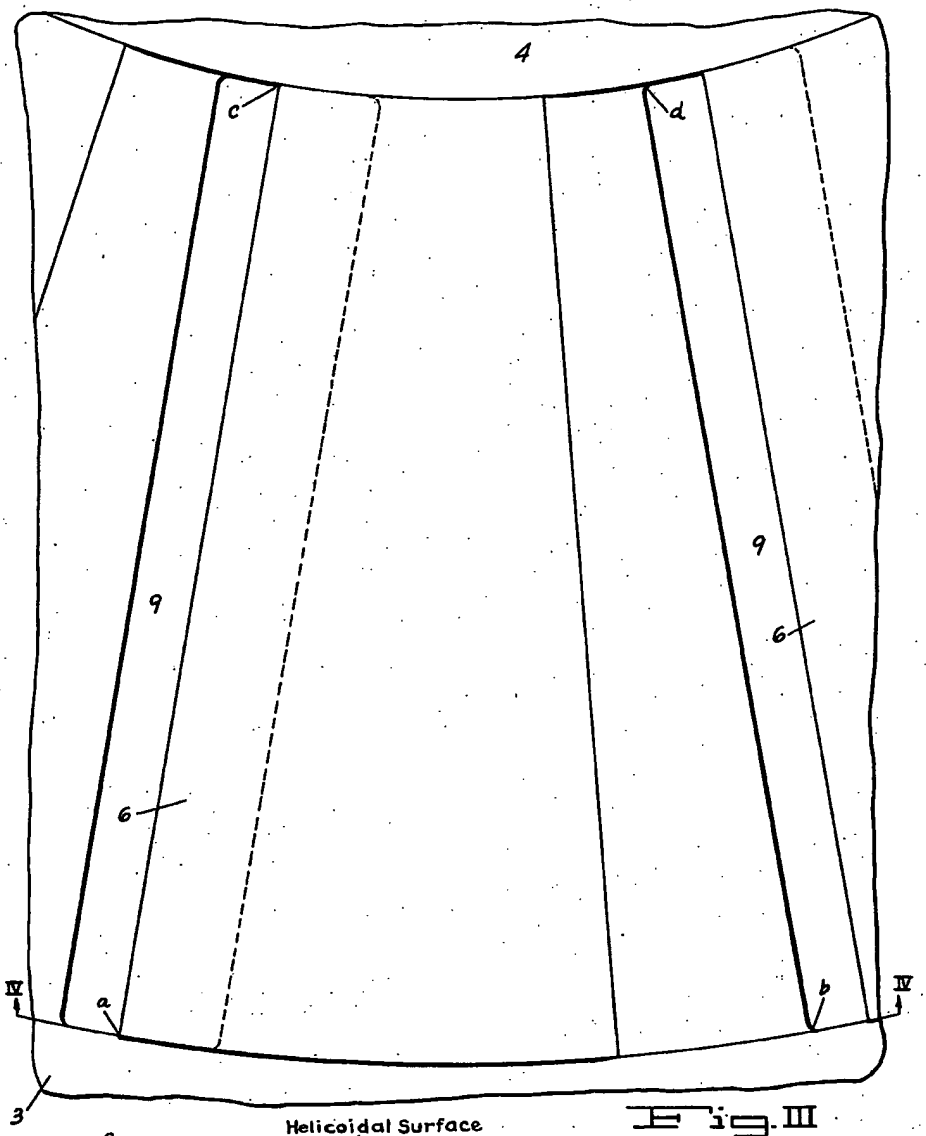


Fig. III

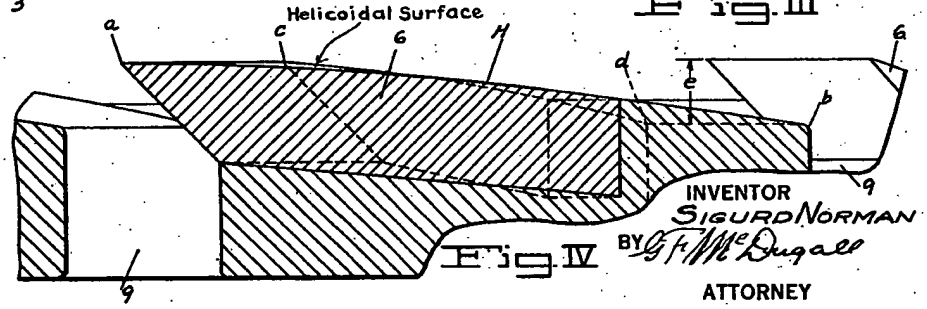


Fig. IV

INVENTOR
SIGURD NORMAN
BY G. F. McDougall
ATTORNEY

Dec. 12, 1939. S. NORMAN 2,183,224

SHREDDING DEVICE

Filed Dec. 14, 1937 3 Sheets-Sheet 3

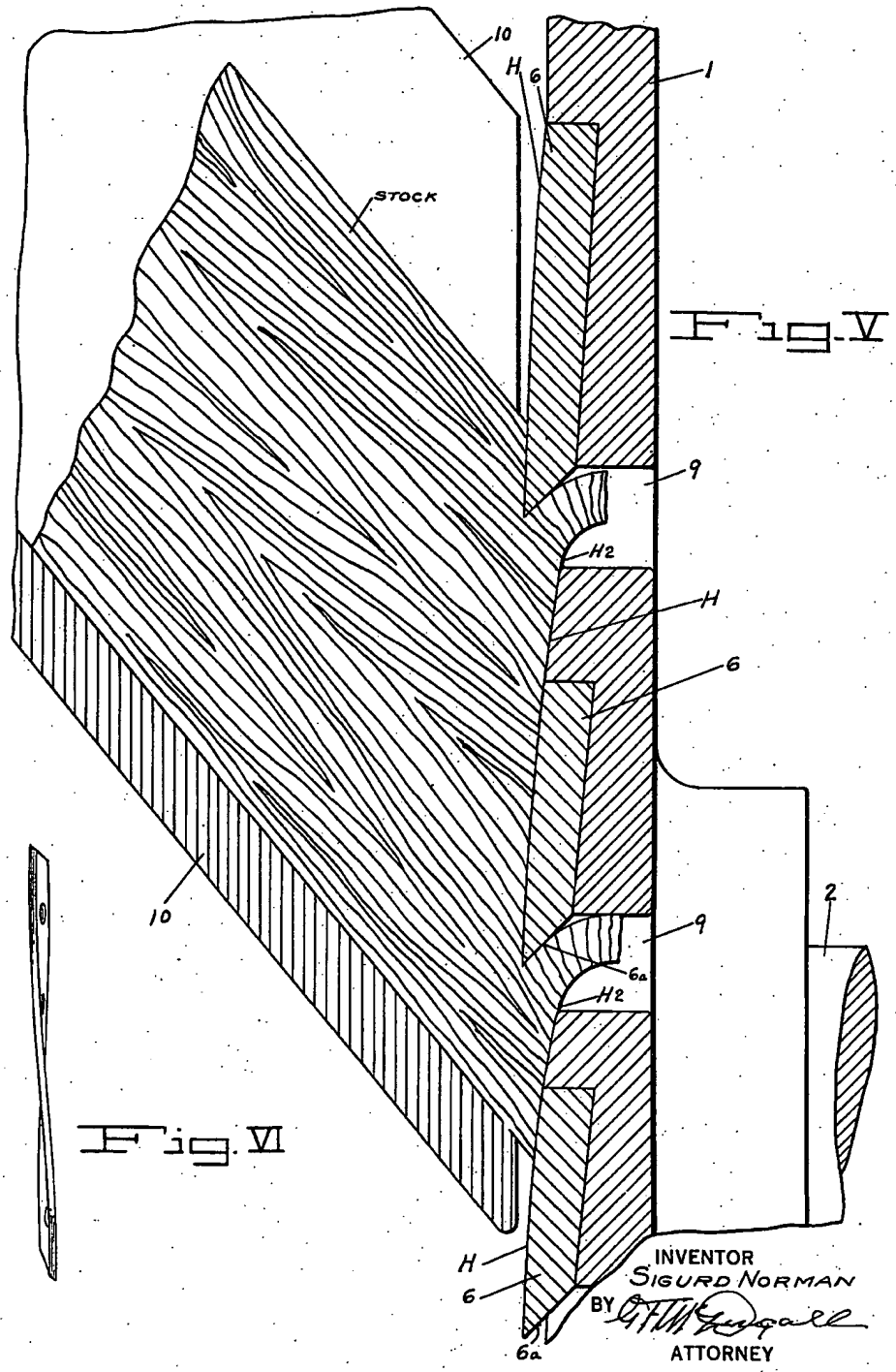


Fig. V

Fig. VI

INVENTOR
SIGURD NORMAN
BY
ATTORNEY